

CHAPTER 6

CONSTRUCTION

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INTRODUCTION

ROADWAY DESIGN GUIDELINES AND STANDARD DRAWINGS

Roadway Design Guidelines (RDG) and Standard Drawings have been created to ensure that there is consistency in TDOT projects across the state. The Roadway Design Guidelines and Standard Drawings indicate the current recognized design standards for new construction or reconstruction of existing highways and shall be utilized while giving due regard to topography, natural conditions, availability of road material, and prevailing traffic conditions.

Throughout these guidelines you will see the following terms used. To clarify the meanings intended in this guide by the use of these terms, the following definitions apply:

- **Designer** – HQ Design, Project Development, or Consultant Designer
- **Design Manager** – HQ Design, Project Development, or Consultant Design Manager
- **Design Team** – HQ Design, Project Development, or Consultant Design
- **Technical Report** – Transportation planning reports (i.e. Transportation Investment Reports (TIR), Transportation Planning Report (TPR)) developed by the Strategic Transportation Investments Division.

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SECTION 1 – PREPARING CONSTRUCTION PLANS

6-100.00 GENERAL NOTES ON PLANS

A list of general notes frequently used on project plans is included in Chapter 9 Section 1. The Designer shall place these notes on the "General Notes" second sheet series of the plans. Designers shall keep the notes grouped together with the sub-headings shown. Good engineering judgment is required in the use of these notes and any other notes in the plans. Only notes that apply to the project shall be added to the plans.

These notes have been agreed upon by the various offices of the Department involved in the design, Right-of-Way acquisition, utility relocation and adjustment, construction, etc.; therefore, care shall be taken that the notes are reproduced on the plans exactly as they are in this document.

6-101.00 SPECIAL NOTES ON PLANS

A list of special notes frequently used on project plans is included in Chapter 9 Section 2. Special notes also include notes written specifically for the project or notes that vary in any way from the standard list of general or special notes listed in Chapter 9 General and Special Notes. The Designer shall place these notes on the "Special Notes" second sheet series of the plans. The Designer should also be aware that individual notes may be required to be included on specific plans sheets as indicated in Chapter 9 General and Special Notes. Notes in the Design Guidelines and Instructional Bulletins specified to be placed in other locations in the plans should continue to be placed as directed.

Special Notes are to be placed and identified on the plans as follows:

1. Special Notes are to be placed in sheets immediately following the General Notes sheets in the plans.
2. The Index Sheet should include "Special Notes" when applicable.
3. General Notes that are modified are to be included as Special Notes.
4. Special Notes are to be grouped together and sub-headers used. For modified general notes, the same sub-header found in the general notes should be used in the Special Notes. Special Notes specific to the project should be placed under the appropriate sub-header or an appropriate sub-header should be created.

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5. Project Specific Notes requested by the Environmental Division should be included in the Environmental Notes or EPSC sheets as Environmental Special Notes except for special circumstances that require the note to be shown on the specific plan sheet for which the note applies. In these cases, a special note should be included in the Environmental or EPSC Special Notes indicating the location of the note.

6-102.00 REVIEW OF PAVEMENT DESIGN

If the Pavement Design is more than 3 years old at the time of the Construction Field Review, the Designer shall submit a request for [Pavement Design Review](#) four months prior to the Construction Field Review. The Designer shall attach the [Pavement Design Review](#) form, the original pavement design, and updated traffic report in a single PDF file and email it to: TDOT.PavementDesign@tn.gov. The Pavement Design Section shall review the original recommendation and submit the updated pavement design, if applicable, to the Designer two months prior to the schedule date of the Construction Field Review to ensure correct information is shown in the Construction Field Review.

The email subject line shall read:

Region X, County Name, Route Name, PIN nnnnnn-nn, Pavement Design Review

6-103.00 CHECKING DRAINAGE PLANS PRIOR TO CONSTRUCTION

Before finalizing drainage plans, the Designer is to ensure that the drainage portion of the Construction plans is consistent with current standard drawings. This will consist of making sure that the invert elevations shown on the proposed plan sheets facilitate the use of standard small drainage structures. The Designer is to use the same invert drop across the structures that are used on the standard drawings. This check must be completed prior to submitting the Construction plans. It is necessary to make this adjustment in order to eliminate costly construction changes to the catch basins, manholes, junction boxes, etc. Check depth for 10 ft. or deeper structures for constructability prior to the Construction Field Review.

Invert elevations are to be shown in the plans for all pipes entering and leaving these small drainage structures. The grate elevation is to be shown for all catch basins. The top of lid elevation is to be shown for all manholes. The top of slab elevation is to be shown for all junction boxes. The proper tabulation of these structures is shown in the TDOT [Drainage Manual](#).

SECTION 2 – PAVEMENT MARKINGS

6-200.00 PAVEMENT MARKING GUIDELINES

These guidelines are general in nature for average-type projects. It is not intended that these guidelines supersede the exercise of good engineering judgment in the development of a pavement marking plan for a project. Special problem areas may require special treatment, that shall be determined at or prior to the Construction Field Review. Traffic volumes may be found in the project specific traffic reports, ETRIMS or the Strategic Transportation Investments Division latest [Traffic Flow Maps](#).

Permanent striping will consist of both centerlines and edge lines on all pavements with a minimum total width of 16 feet.

If surface materials other than hot plant mix asphalt (such as cold mix asphalt, DBST, etc.) are applied, no temporary or permanent centerline markings will be required, since these surface materials would be incapable of retaining the pavement markings.

See Chapter 6 Section 6-201.00 through 6-205.00 for guidance for temporary and permanent pavement marking and Chapter 9-135.00 for pavement marking general notes.

See [Traffic Design Manual, Chapter 14, Signing and Pavement Markings](#).

6-201.00 TEMPORARY PAVEMENT MARKINGS

Temporary pavement markings on the intermediate layers of pavement open to traffic will be installed to permanent standards daily with reflectorized paint or the approved QPL equivalent. If there are no centerline pavement markings on the existing roadway before the proposed construction or resurfacing project begins, no temporary centerline pavement markings will be required on the roadway during construction.

The temporary pavement markings will be paid for under Item Number 716-05.01, Painted Pavement Marking (4" Line) per L.M., Item Number 716-05.20, Painted Pavement Marking (6" Line), per L.M., Item Number 716-05.02, Painted Pavement Marking (8" Barrier Line), or Item Number 716-05.49, Painted Pavement Marking (8" Line) per L.F.

If the permanent marking material is thermoplastic, the contractor may elect to mark the final layer of pavement with reflectorized paint to permanent standards daily and wait until the paving operation has been completed before the permanent markings are installed. In this case, the temporary markings for the final layer will not be measured and paid for directly, but the costs are to be included in the price bid for the permanent markings.

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6-201.01 TEMPORARY PAVEMENT MARKING FOR USE ON PAVEMENT SURFACE OTHER THAN FINAL

1. ON ALL FREEWAYS AND CONTROLLED ACCESS ROUTES (During Construction)

A. On Non-Transition Sections:

- a. **Lane lines** – use 8” painted white skip lines (Item Number 716-05.49, Painted Pavement Marking (8” line)) and white raised pavement markers (716-01.06, Temporary Raised Pavement Marker, White) on 40’ spacing.
- b. **Left edge lines** (yellow) – Use 8” painted solid yellow lines (Item Number 716-05.49, Painted Pavement Marking (8” line)) and yellow raised pavement markers (Item No. 716-01.07, Temporary Raised Pavement Marker, Yellow) on 20’ spacing.
- c. **Right edge lines** (white) – Allow as equals:
 - (1) Use 8” solid white wet-reflective temporary tape (according to manufacturer’s specifications). (Item No. 712-09.21, Removable Wet Reflective Pavement Marking Tape)
 - (2A) Use 8” painted solid white lines (Item No. 712-09.02, Removable Pavement Marking (8” barrier line)) with an approved white barrier rail delineator on top of barrier rail (Item No. 712-04.50, Barrier Rail Delineator) on 20’ spacing, and **OR**
 - (2B) Use 8” painted solid white lines (Item No. 716-05.49, Painted Pavement Marking (8” Line)) only with white flexible delineators (Item No. 712-04.10, Temporary Flexible Tubular Delineator) at outside edge of shoulder on 20’ spacing when no barrier rail is present.

B. On Transition Sections

- a. **Lane lines** – Use 8” painted solid white lines (Item No. 716-05.49, Painted Pavement Marking (8” Line)) and white raised pavement markers (Item No. 716-01.06, Temporary Raised Pavement Marker, White) on 20’ spacing.
- b. **Left edge lines** (yellow) – Use 8” painted solid yellow lines (Item No. 716-05.49, Painted Pavement Marking (8” Line)) and yellow raised pavement markers (Item No. 716-01.07, Temporary Raised Pavement Marker, Yellow) on 20’ spacing.
- c. **Right edge lines** (white) – Allow as equals:

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- (1) Use 8" solid white wet-reflective temporary tape (Item No. 712-09.21, Removable Wet Reflective Pavement Marking Tape). (according to manufacturer's specifications)
- (2A) Use 8" painted solid white lines (Item No. 712-09.02, Removable Pavement Marking (8" barrier line)) with an approved white barrier rail delineator on top of barrier rail (Item No.712-04.50, Barrier Rail Delineator), on 20' spacing, **OR**
- (2B) Use 8" painted solid white lines (Item No. 716-05.49, Painted Pavement Marking (8" Line)) only with white flexible delineators (Item No. 712-04.10, Temporary Flexible Tubular Delineator) at outside edge of shoulder on 20' spacing when no barrier rail is present.

NOTES:

- (1) Raised pavement markers are to be placed in a single row, not staggered, under all applications.
 - (2) If Project Engineer has specific recommendations, they should be discussed at the Construction Field Review.
 - (3) Missing raised pavement markers shall be replaced:
 - a. at least monthly or,
 - b. at the instruction of the engineer
 - (4) All raised pavement markers shall be removed before placement of the final pavement surface. The cost of removal shall be included in the price bid for raised pavement markers, Item Numbers 716-01.05 Temporary Raised Pavement Marker per Each, 716-01.06 Temporary Raised Pavement Marker, White per Each, and/or 716-01.07 Temporary Raised Pavement Marker, Yellow per Each.
2. STATE ROUTES WITH 4 OR MORE LANES (Unlit During Construction)
- A. **Lane Lines** – Use 8" wide white painted skip lines (Item No. 716-05.49, Painted Pavement Marking (8" Line)) and raised pavement markers (Item No. 716-01.06, Temporary Raised Pavement Marker, White) on 80' spacing.
 - B. **Edge and center lines** – Use solid lines (yellow or white, as appropriate) with an 8" width. Raised pavement markers (yellow or white, as appropriate) may be specified for use on a case-by-case basis, as determined at the Construction Field

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Review. Raised pavement markers should not be used on right edge line. When raised pavement markers are used for the left edge line, spacing shall be 20 feet.

NOTES:

- (1) Raised pavement markers are to be placed in a single row, not staggered, under all applications.
- (2) If Project Engineer has specific recommendations, they should be discussed at the Construction Field Review.
- (3) Missing raised pavement markers shall be replaced:
 - a. at least monthly or,
 - b. at the instruction of the engineer
- (4) All raised pavement markers shall be removed before placement of the final pavement surface. The cost of removal shall be included in the price bid for raised pavement markers, Item Numbers 716-01.05 Temporary Raised Pavement Marker per Each, 716-01.06 Temporary Raised Pavement Marker, White per Each, and/or 716-01.07 Temporary Raised Pavement Marker, Yellow per Each.

3. ALL OTHER STATE ROUTES

All Lines – Use 4" marking lines. Centerline yellow raised pavement markers may be considered on a case-by-case basis. Discuss need at Construction Field Review.

NOTES:

- (1) Raised pavement markers are to be placed in a single row, not staggered, under all applications.
- (2) If Project Engineer has specific recommendations, they should be discussed at the Construction Field Review.
- (3) Missing raised pavement markers shall be replaced:
 - a. at least monthly or,
 - b. at the instruction of the engineer.
- (4) All raised pavement markers shall be removed before placement of the final pavement surface. The cost of removal shall be included in the price bid for raised pavement markers, Item Numbers 716-01.05 Temporary Raised Pavement

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Marker per Each, 716-01.06 Temporary Raised Pavement Marker, White per Each, and/or 716-01.07 Temporary Raised Pavement Marker, Yellow per Each.

6-202.00 PERMANENT PAVEMENT MARKINGS

The Designer should refer to Tables 6-1A and 6-1B for pavement marking guidelines for all freeways and state routes. In addition to pavement marking guidelines, Tables 6-1A and 6-1B provide guidance for the placement of rumble strips and rumble stripes. This guidance shall be used on all new, reconstruction, and resurfacing projects except in areas which require special treatment as determined at the Construction Field Review and approved by the Director of the Roadway Design Division.

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Type	Thickness (mils)	Bead Package	Pavement Type				Comments
			Asphalt			Concrete	
			Conventional	OGFC	HFS		
Thermoplastic Spray	60	Type I	X		X	X	Spray Thermoplastic, Multipolymer
Thermoplastic Extruded	100	Type I & IV	X	X Note 1	X	X	Enhanced Flatline Thermoplastic, Multipolymer
Thermoplastic Ribbon	100	Type I & IV	X	X Note 1	X		Enhanced Flatline Thermoplastic with clean borders, Multipolymer
Profile Thermoplastic	125	Type IV	X	X	X	X	Audible feedback, Wet visibility Per SP 716PTA
Polyurea	20	Type I	X	X	X		Moisture resistance
Tape	85	NA	X			X	
Specialty Pavement Markings							
Extruded	100	Type I & IV	X Note 2		X Note 2	X Note 2	Enhanced Flatline Thermoplastic,
Pre-formed	90 - 125	N/A	X Note 2		X Note 2	X Note 2	
Temporary Traffic Control							
Paint	15	N/A	X	X	X	X	See Chapter 6-200.00
<p>Notes:</p> <ol style="list-style-type: none"> For projects using an Open-Graded Friction Course (OGFC) for the surface layer, only Enhanced Flatline Thermoplastic (Item No 716-12.02) may be used for the edge, center, skip and lane lines. Use the width of line specified in Table 6-1B. The Designer shall footnote the Enhanced Flatline Thermoplastic Quantity with the following note: <i>“Contractor shall use the extruded or ribbon method for application.”</i> Specialty Striping Items: stop lines, cross walks, arrows, words, shapes, channelization, and other specialty striping items other than lane and edge lines. The contractor may elect to use either thermoplastic or preformed thermoplastic for specialty striping items. 							

**Table 6-1A
Permanent Pavement Markings Selection Guide Base on Pavement Type**

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Notes:

1. Snowplowable Raised Pavement Markers (SRPMs) shall conform to this guidance:
 - a. SRPMs located along centerlines of 2 direction roadways (Yellow Stripe) shall be paid for under Item No. 716-01.21 “Snowplowable Raised Pavement Markers (Bi-Dir) (1-Color)” per each. Lenses shall be yellow.
 - b. SRPMs on lane lines between lanes of the same travel (Broken White Stripes) direction on undivided roadways shall be paid under Item No. 716-01.22, “Snowplowable Raised Pavement Markers (Mono-Dir) (1-Color)” per each. Lenses shall be clear or white.
 - c. SRPMs on lane lines between lanes of the same travel (Broken White Stripes) direction on divided roadways shall be paid for under Item No. 716-01.23, “Snowplowable Raised Pavement Markers (Bi-Dir) (2-Color)” per each. Lenses shall be clear or white on the upstream side (facing traffic), lenses shall be red facing downstream side (facing wrong-way traffic).
 - d. Refer to T-M-series standard drawings for details. Three lane and multilane roads with 2-way traffic will normally require both mono-directional and bi-directional snowplowable raised pavement markers. Two lane roads will normally require bi-directional snowplowable raised pavement markers.
 - e. Payment for the removal of Snowplowable Raised Pavement Markers shall be paid for under Item number 716-01.30 (Removal of Snowplowable Reflective Marker, per each). The cost shall not be included in the cost of installing the following items for Snowplowable Reflective Marker: 716-01.21, 716-01.22, and 716-01.23.
 - f. Installation of SRPMs may be optional at undivided rural state routes with speed < 45 mph if historical crash data supports lane departure concerns.
2. Rumble Strip/Stripe
 - a. All resurfacing projects shall follow the guidance in Table 6-1B for pavement marking and rumble installations. See 6-205.02 and 6-205.03 for additional guidance regarding rumble strip and rumble stripe placement. Application of rumble shall be included on all rural roadway resurfacing projects if there is no existing rumble on the shoulder. Pavement markings and rumble strips/stripes shall be applied to the roadway surface after it has been scraped clean of overgrown vegetation and swept of loose debris.
 - b. Rumble strips are not required on ramps.
 - c. If a bike lane is proposed on a shoulder, only non-continuous rumble shall be used. See Standard Drawings MM-PM-2, T-M-15A and T-M-16.

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- d. Centerline Rumble Stripes (See T-M-16A) may only be used if justified by crash history and if the road meets the following conditions:
 - i. Design Speed of 45 mph or greater
 - ii. ADT of 2000 or greater
 - iii. Lane width of 12 feet or greater
 - iv. Undivided Section
 - v. No passing or one-way passing zone
- e. For concrete shoulders, the rumble strip is to be placed in accordance with standard drawings RP-CS-1 or RP-CS-2. Item No. 501-03.10, Concrete Shoulder Rumble Strip, L.F. The length of scoring shall be measured as the actual length of pavement scored.
- f. Freeways and divided highways, See STD DWG T-M-15

Undivided state routes, See STD DWG T-M-15A, STD DWG T-M-16, and 16A
- g. The Designer or the Field Engineer may choose to alternate rumble with profile thermoplastic pavement marking (per SP716PTA) when the following conditions exist:
 - i. On roadways with rigid pavement shoulders, when it is not practical or desirable to install ground-in rumble on the inside and outside edge line pavement markings.
 - ii. On shoulder pavement types, Micro surface and Thin lift.
 - iii. On bridge decks without an asphalt layer.
3. Specialty Pavement Marking Materials: Polyurea, Profile Thermoplastic, and Tape. The Designer may choose to use one of the specialty pavement marking material as needed.
4. Use applicable standard drawings:
 - a. Freeways, See STD DWG T-M-5, T-M-6, T-M-7, and T-M-8
 - b. State Route, See STD DWG T-M-1, T-M-2, and T-M-3
 - c. HOV Lanes, See STD DWG T-M-5
 - d. Gore Areas, See T-M-6, SRPM along edge line only.
5. Dotted Lines and Dotted Line Extensions shall be utilized when called out on the Standard Drawings. See Standard Drawings T-M-4, 5, 6, and 8.

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6. On Local Roads with the ADT \geq 2000, permanent pavement markings may be Item Number 716-13.02 Spray Thermo Pavement Marking (60 mil 6 IN) per L.M. or Item Number 716-12.02 Enhanced Flatline Thermoplastic Pavement Marking (6 IN) per L.M.
7. For non-State Route Local Roads with ADT < 2000, no permanent striping is required on the final surface if Item Number 716-05.01 Painted Pavement Marking (15 mil 4 IN) is used as the temporary striping for the final layer.
8. Low cost resurfacing treatments may have modified marking recommendations.

6-203.00 RAISED BITUMINOUS RUMBLE STRIPS

Raised bituminous rumble strips are a traffic warning device. Raised bituminous rumble strips will require a detail to be furnished in the plans. This type of rumble strip is to be used for warning or unexpected stop conditions and shall not be used routinely as a shoulder treatment. At approaches to narrow bridges, where the shoulder width is less than the normal roadway shoulder width, the raised bituminous rumble strip may be used to warn the motoring public of this roadway condition.

6-204.00 RUMBLE STRIPS

Scored rumble strips are a traffic warning device, and when required, shall be constructed in accordance with Standard Drawings RP-CS-1, RP-CS-2, T-M-15, T-M-15A or as shown on the plans. Raised bituminous rumble strips and scored rumble strips are the two types of rumble strips normally used in Tennessee.

Scored rumble strips and scored rumble stripes provide an audible warning to vehicles leaving the travel lane. Unlike a scored rumble stripe which is placed at the edge line location, a scored rumble strip is placed on the shoulder adjacent to the travel lane and edge line.

Refer to *Chapter 6-202.00, Permanent Pavement Markings*, for guidelines for placement of rumble strips on shoulders. Scored shoulders will be constructed on asphalt or concrete shoulders. Scored shoulders should also be omitted adjacent to ramps, acceleration and deceleration lanes including tapers and along the radius of side road approaches, entrances and median crossovers.

Rumble strips shall be specified on all new construction and resurfacing projects on freeways and access controlled state routes. Both the inside and the outside shoulders shall be scored. The scored rumble strip shall be constructed in accordance with Standard Drawing T-M-15. Rumble strips are to be paid for under Item No. 411-12.01 Scoring Shoulders (Continuous) (16 inch Width) per L.M. For estimating purposes, the item will be measured longitudinally along the edge of each shoulder and will usually be two (2) times the project length less deductions for entrance and exit ramps, public roads, and bridges. When concrete shoulders are present rumble

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strips are to be constructed in accordance with Standard Drawing RP-CS-1 or RP-CS-2. Rumble strips on concrete shoulders shall be paid for under Item No. 501-03.10 Concrete Shoulder Rumble Strips per L.F. and the item will be measured as the actual length of pavement scored along each shoulder.

Refer to *Chapter 6-202.00, Permanent Pavement Markings*, for guidelines for placement of rumble strips on non-access controlled state routes. When rumble strips are placed on non-access controlled routes, paved shoulders should be 8 ft. or wider. A 60 foot rumble will be followed by a 15 foot gap in the rumble to allow for bicycles to cross without having to traverse the rumble strip. Rumble strips should normally only be placed on rural routes with posted speeds of 45 mph or greater. Rumble strips may be used on urban routes where crash history or other factors warrant the placement. When placed on urban routes, the Designer should consider expected bicycle traffic and noise generated. The scored rumble strip shall be constructed in accordance with Standard Drawing T-M-15A. Rumble strips are to be paid for under Item No. 411-12.02 Scoring Shoulders (Non-continuous) (16 inch Width) per L.M. The item will be measured and paid as the actual length of pavement scored along each shoulder.

6-205.00 RUMBLE STRIPES

Rumble stripes are a traffic warning device, and when required, shall be constructed in accordance with Standard Drawing T-M-16. A scored rumble stripe is a scored rumble placed along the outside edge line of the travel lane. Striping is to be paid for under the appropriate pavement marking item number.

Refer to *Chapter 6-200.00, Pavement Marking Guidelines* for guidelines on the placement of rumble stripes. Rumble stripes should normally only be placed on rural routes with posted speeds of 45 mph or greater. The rumble stripe shall consist of a 60 foot scored rumble followed by a 15 gap to allow for bicycles to cross without having to traverse the rumble. Rumble stripes may be used on urban routes where crash history or other factors warrant the placement. When placed on urban routes, the Designer should consider expected bicycle traffic and noise generated. Rumble stripes may be omitted from locations recommended by the TDOT Bicycle Coordinator.

Scored rumble stripes are to be paid for under Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8 inch Width), per L.M. or Item No. 411-12.04, Scoring for Rumble Stripe (Non-Continuous (4 inch Width), per L.M. The item will be measured and paid as the actual length of pavement scored along each shoulder.

6-206.00 SAFETY EDGE

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A safety edge is a sloped (25 to 30 degree) asphalt edge that more easily allows vehicles that have run off the road to regain the roadway than a standard vertical face. The Designer should calculate the additional quantities needed for the pavement required for safety edges.

On all new construction projects involving asphalt paving without curbs, a safety edge will be applied to the edge of all layers of mix.

For resurfacing projects, a safety edge will be applied only when identified on the PS&E Report submitted by the Regional Resurfacing Coordinator. If the total existing drop off and any additional elevation difference from paving operations results in a drop off exceeding 1.75", a safety edge should be used. See *Chapter 9-140.00, Pavement*, for note that shall be added to the plans on all projects that specify safety edge.

6-207.00 FLEXIBLE DELINEATORS

Flexible delineators will be installed on all freeway and access-controlled highways. Flexible delineators may also be used on other routes. On resurfacing projects (4R, etc.), the Designer will be responsible for computing the quantity of flexible delineators and shall refer to Roadway Standard Drawing T-WZ-PBR2 to calculate quantities. The Designer shall replace delineators along the ramps as well as along the main line on freeway and access-controlled highway resurfacing projects.

On projects with signing and marking plans, the location of the flexible delineators should be shown on the signing and marking plan sheets. If signing and marking plans are not included, the Designer does not need to show the location of the proposed delineators but must make sure Roadway Standard Drawing T-S-11 is included in the plans so the proper location can be determined by the engineer and contractor.

6-208.00 SPECIALTY PAVEMENT MARKINGS

Contractors will have the option of using either Thermoplastic or Preformed Plastic Pavement Markings specialty markings. For plan development and bidding purposes, Designers will use the appropriate Thermoplastic Pavement Marking items numbers. All specialty pavement marking item numbers shall be footnoted:

"Contractor may elect to substitute Preformed Plastic for Thermoplastic. Preformed Plastic shall be paid for at the same unit price as bid for Thermoplastic."

On projects where plastic specialty pavement items are being used, the following items will be used:

1. Crosswalk with longitudinal lines as shown on Standard Drawing T-M-4 will use the following pay item:

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716-02.09, Plastic Pavement Marking (Longitudinal Cross Walk) per L.F.

The measurement for this marking is identical to that for standard crosswalk, for example, one measurement along the centerline of the crosswalk (perpendicular to curbs).

2. Dotted white line for vehicle double turn path delineation requires an 8-inch stripe. Pay item will be as follows:

716-02.08, Plastic Pavement Marking (8" Dotted Line) per L.F.

6-209.00 USE OF REMOVABLE PAVEMENT MARKING LINE

Item No. 712-09.01, Removable Pavement Marking Line per L.F., shall be used as temporary marking for directional or separation of traffic during the traffic control phases of construction when these lines are used on a roadway surface that is to remain in place and undisturbed. Item No. 712-09.08, Removable Pavement Marking Line per L.F., shall be used for lane shifts as shown in T-WZ-16. When a barrier is in use, item no. 712-09.02, Removable Pavement Marking Line (8" Barrier Line) shall be used in that location as shown the Standard Drawing.

6-210.00 SNOWPLOWABLE RAISED PAVEMENT MARKERS

Snowplowable raised pavement markers shall be included on all freeway and full-access controlled roadways. See Table 6-1B for guidance.

Snowplowable raised pavement markers should be included on state routes with the exception of undivided state routes with speed < 45 mph. Reflective pavement markers are to be placed in accordance with the Roadway Standard Drawing T-M-series and the current edition of the MUTCD.

Spacing of snowplowable raised pavement markers may be reduced or additional snowplowable raised pavement markers added in areas that require special treatment as determined by the Design Manager or at the construction field review. When additional snowplowable raised pavement markers are used, the markers shall be placed in accordance with the current edition of the MUTCD. Raised pavement markers may be omitted on urban roadways where roadway lighting is present. Raised pavement markers should not be used on the right edge line. See Table 6-1B for guidance regarding type of markers to be used.

On freeway, full-access control, and state route resurfacing projects, the Resurfacing PS&E Team shall be responsible for verifying the existence of snowplowable raised pavement markers and for computing the quantity of these markers for removal. The Designer shall also

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compute the quantity for new snowplowable raised pavement markers to be installed for these projects.

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SECTION 3 – SIGNS

6-300.00 ROADWAY SIGNING SHEETS DEVELOPMENT GUIDELINES

The development of signing plans and sign schedule sheets is the responsibility of the Design Office preparing the roadway plans. A Designer is assigned in each regional Design Office to serve as the Signing Designer. The Signing Designer is responsible for development of all roadway signing and sign schedule sheets for projects developed in the region. In addition, the Signing Designer will provide signing, item numbers, quantities, signing details, standard drawings, and signing notes to roadway Designers. See [Traffic Operations Division, Traffic Design Manual, Chapter 14, Signing and Pavement Markings](#) and [Traffic Operations Sign Policy, Design and Programs Section](#) webpage for more guidance.

The Roadway Design Manager will be responsible for determining whether the Signing Designer or the Roadway Designer will be responsible for CADD work to place signing on plans sheets for individual projects.

Regional Roadway Design Managers and Signing Designers

Region 1	Christie Brown	Design Manager (865) 594-0742	Christie.Brown@tn.gov
	Randy Plummer	Signing Designer (865) 594-0716	Randy.Plummer@tn.gov
Region 2	Robert Rodgers	Design Manager (423) 510-1138	Robert.Rodgers@tn.gov
	Kevin Crisp	Signing Designer (423) 634-7522	Kevin.Crisp@tn.gov
Region 3	Sharon Schutz	Design Manager (615) 350-4208	Sharon.Schutz@tn.gov
	Scott Johnson	Signing Designer (615) 350-4263	Scott.Johnson@tn.gov
Region 4	Gary Scruggs	Design Manager (731) 935-0149	Gary.Scruggs@tn.gov
	Larry Brasher	Signing Designer (731) 935-0144	Larry.Brasher@tn.gov

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The Design Manager will be responsible for determining if Signing and/or Pavement Marking sheets are needed on projects other than freeways and full-access controlled highways. On all other projects, the proposed signing will normally be located on the proposed layout sheets. On projects utilizing pavement marking sheets, proposed signing should be shown on the same sheets.

The workflow for preparation of roadway signing plan sheets is as follows:

1. At the start of construction plans preparation, the Designer will provide a PDF set of plans, proposed layout sheet (or signing and marking sheet files) CADD files to the regional signing Designer to develop signing and sign schedule sheets.
 - a. After developing signing and sign schedule sheets, the Signing Designer submits a PDF file to Regional Traffic Engineering Office for review.
 - b. The Regional Traffic Engineering Office reviews the proposed signing and provides the Signing Designer with any comments.
 - c. The Signing Designer makes any needed changes and submits a PDF file of the proposed Signing Sheets and Sign Schedule sheets to the Traffic Operations Division, Headquarters Traffic Engineering Office (TDOT.TrafficOps.Sign-Reviews@tn.gov) for review.
 - d. The Signing Designer submits the proposed signing and sign schedule sheets to the Roadway Designer at the Final Plans Review, which is eight weeks prior to construction plans turn-in.

Freeway and full access control projects

For freeway and full access control projects Signing and Pavement Marking sheets will be developed for placement of signing and pavement markings.

The Signing Designer should coordinate with the Roadway Designer concerning any design issues that may arise during the development of the signing plans. The Signing Designer should coordinate with the Structures Division to have overhead, cantilever, or bridge mounted structures be designed and structural standard drawing numbers are received.

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Consultant Projects

For projects developed by design consultants, signing will be developed by the consultant Designer. The consultant will be responsible for furnishing PDF plans and CADD files to the Roadway Design Manager when construction plans are started. The Roadway Design Manager will forward the information to the Signing Designer to develop project signing as outlined above.

Other Projects

On projects (resurfacing, bridge replacement, etc.) requiring no more than three sizes of permanent signs, the Designer may place Traffic Operations Standard Drawing T-S-20 Sign Details in the Index of Standard Drawings. The Designer will need to show the proposed location and designate the type of sign (R1-1, R1-2, TN-5, etc.) on the plans. These signs will be paid for per each under Item Numbers. 713-16.20 through 713-16.39. Appropriate Foot Notes, General Notes, and Standard Drawings will also need to be included.

If any sign needed for a project is not included on Traffic Operations Standard Drawing T-S-20, or if there are any questions, contact the Regional Design Office Signing Designer for further guidance.

6-301.00 ADVANCE GUIDE SIGNS AND EXIT DIRECTIONAL SIGNS ON TRAFFIC CONTROL PLANS

The Designer shall include advance guide signs and exit directional signs (green and white signs) on all phases of the traffic control plan for projects on access controlled highways including interchange cross streets. Advance guide signs and exit directional signs should also be shown on the traffic control plan on access controlled resurfacing projects when the traffic control phasing requires the placement of temporary pavement markings which conflict with directional signs or requires directional signs to be relocated or adjusted. It will be the Designer's responsibility to prepare any required traffic control sheets for all phases showing the layout and location of all directional and guide signs. Supplemental signing is not required to be shown.

Existing signs should be used as part of the traffic control plan for as long as possible throughout the different construction phases provided signs are located in accordance with MUTCD and do not provide inaccurate information. The most common conflict of existing signing with new construction occurs when overhead guide signs with down arrows or diagrammatic signs displaying lane lines are over lanes that are closed during certain construction phases. Once existing signs cannot be used at the original location, the Designer should attempt to relocate the existing sign or place the permanent sign. If relocation or placement of the permanent sign is not feasible, a new temporary advance guide sign or exit directional sign shall be shown on the traffic

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control plan for the affected construction phase and for any other construction phase the sign is needed. Sign location shall conform to the MUTCD. Sign size should be the same as the sign removed if feasible. There shall be at least one temporary advance directional and temporary exit directional for each exit on the project.

For signs located on overhead structures, the Designer should contact the Traffic Operations Division, Traffic Operations Sign Policy, Design and Programs Section (TDOT.TrafficOps.Sign-Reviews@tn.gov) and the Regional Traffic Engineer for additional guidance.

The following guidance should be used when it is necessary to install temporary exit directional signs or temporary advanced guide signs. The Designer should contact the Traffic Operations Division, Traffic Operations Sign Policy, Design and Programs Section (TDOT.TrafficOps.Sign-Reviews@tn.gov) or the Regional Traffic Engineer for any additional technical questions or guidance required.

2. In the event it is not feasible to replace an exit directional sign with the existing sign size, the new sign shall be 48" x 96", 0.100" sheet aluminum. The letters will be minimum 8 inch "D" (all capital) letters and there will be a $\frac{3}{4}$ " border with a 2" radius. The color will be a reflective green background with a reflective white copy. The supports will be included in the sq. ft. of the sign face as it is with other construction signs.
 - a. The information on exit directional signs should be the same as the information on the existing signs that were removed. There shall be no more than four lines of copy on these signs. The layout of these signs should look as close to the existing as possible.
 - b. On advanced guide signs; the first line shall be the exit number for the interchange (i.e. EXIT 234), the second line will be the first destination (i.e. OLD HICKORY BLVD), the third line will be the second (i.e. MADISON), the fourth line will be NEXT RIGHT (Center all lines of copy). These signs should be located no closer than one half mile from the exit directional sign.
 - c. The exit directional sign shall have the same exit number and destinations as the advance guide but in lieu of NEXT RIGHT there will be a type "B" arrow at a 45 degree angle to the right. (Center all lines of copy.) These signs should be located at the beginning of the taper for the appropriate exit ramp.
 - d. If an interchange has a TN (TN-6a -TN-6d) or U.S. (M1-4) route shield on the directional signing, then a shield, and if needed, a cardinal direction (M3-1 – M3-4) shield, will be shown mounted to the left support under both the advance and exit directional signs.

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- e. If more lines of copy are needed, then the Designer can add a 24" x 96" or another 48"x 96" aluminum sheet to the bottom of the first sign, but the size shall not be larger than a total of 96"x96".
- f. Removal of existing signs shall be paid for under item number 713-15, Removal of Signs, Posts, and Footings, Lump Sum.
- g. New signs shall be paid for under item number 712-06, New Signs (Construction), per S.F. Design Managers should contact the HQ Construction Office to have item numbers assigned when the traffic control plan involves relocating existing signs.
- h. See Chapter 9-160.00 for notes to be placed in the General Notes on all access controlled and freeway projects and on access controlled and freeway resurfacing projects when the traffic control phasing requires placement of temporary pavement markings which conflict with directional signs or requires directional signs to be relocated or adjusted.

If advance guide signs or exit directional signs are included in the traffic control plan, the Designer or Design Manager (for consultant projects) shall upload the traffic control plan to FileNet and an email notification sent to the Traffic Operations Division, Traffic Operations Sign Policy, Design and Programs Section (TDOT.TrafficOps.Sign-Reviews@tn.gov) a minimum of twelve weeks prior to the construction field review for review. For resurfacing projects with advance guide signs or exit directional signs, plans should be sent as soon as possible. Only traffic control plans with advance guide signs or exit directional signs shall be sent to the Traffic Operations Division, Traffic Operations Sign Policy, Design and Programs Section for review.

The Designer shall place a copy of the email in the project folder to document the submittal of traffic control plans for advance guide or exit directional signing review.

The naming convention for the traffic control plan PDF will include the PIN and the Region #, nnnnnn-nn-TrafficControlReview-RegX.pdf. If there are modifications to the traffic control plans that affect the advance guide signs or exit directional signs, then the naming convention will be nnnnnn-nn-TrafficControlReview-RegX-Rev-00-00-00.pdf. The revised traffic control plan review request will contain all traffic control sheets.

Example: 123456-00-TrafficControlReview-Reg1.pdf

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6-302.00 HISTORICAL MARKERS

On projects impacting a Tennessee Historical Marker sign, the Designer shall add Item Numbers 713-16.50 to 713-16.60 "Remove and Replace Sign (description)" per EACH to the quantities, as needed. The Designer shall also add special note from *Chapter 9-220.00*.

SECTION 4 – CONSTRUCTION PROCESS

6-400.00 CONSTRUCTION PROCESS

Most of the design has been completed at this point and second sheets, finalized quantities, and coordination are the focus. The Construction process consists of compiling sheets, ensuring notes are included, and verifying commitments are addressed. The Construction Division will utilize the plans for both advertising and letting the project.

6-401.00 FINAL CONSTRUCTION PLANS SUBMITTAL FORMAT

To facilitate the requirements of *Chapter 1-206.02 Sealing Construction Plans*, all plans will be submitted as PDF portfolios. Refer to the document [CADDV8.pdf](#) for proper naming convention for MicroStation Sheet files (.sht) from which the corresponding Adobe PDF (.pdf) files are created.

A Plans Assembly check needs to be completed prior to submitting final plans. It is the responsibility of the Designer to review the final plans to ensure that sheet numbers are correct according to the index and are in order; pdf pages rotated correctly; PDF sheet sizes for pdfs created from MicroStation are 33" x 21"; PDF sheet sizes for scanned in sheets are 34" x 22"; and indexes set up correctly prior to turn in.

6-401.01 SUPPLEMENTAL CONSTRUCTION PLAN SET SUBMITTALS

For all non-Roadway Design Plan Series to be included in the Construction Submittal Package, the Designer shall include them in the Sheet Index category following the example in *Chapter 1 Figure 1-51*. More information on the types of plan sets that need to be included and warrants for inclusion can be found in the [Construction Checklist](#).

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6-401.02 SUBMITTAL OF CONSTRUCTION PLANS FOR LETTING PROCESS

When the final construction plans are turned in for the Letting process for [PPRM](#) Activity # 715 Finalize Roadway Construction Plans, the Designer or Design Manager shall upload the Construction Submittal Package to FileNet (See *Chapter 1-105.08 – Final Construction Plans FileNet Submittal Package*). The Designer or Design Manager shall email the Construction Submittal Letter, Grading Report (See *Chapter 2-708.00 – Grading Report*), and Construction Estimate (see *Chapter 1-402.05 – Submittal of Construction Estimate for Letting Process*) to the addresses shown in Table 1-12 for the internal email distribution list. The body of the email shall include that the construction plans and estimated roadway quantities Excel file have been uploaded to FileNet (See Table 1-12 in Chapter 1 General of the Roadway Design Guidelines). A copy of the email shall be placed in the project folder to document the submittal of the construction estimate.

6-402.00 LETTING REVISIONS

The determination of a letting revision will be made by the Headquarters Construction Office. One week prior to the release of the Notice to Contractors, no letting revisions shall be submitted. Any change to plans at this point shall be issued as an addendum by the HQ Construction Division. If a Letting Revision is issued but no quantities were revised the Designer shall state “No Quantities Affected” in the body of the email. This information is necessary in order to maintain a current and accurate estimate. The completed form shall be attached to the letting revision notification email. For additional information on the Estimate Revision Process see *Chapter 1-402.06*.

The Designer or Design Manager responsible for the project will upload the revised plan set to Design FileNet (See Chapter 1-105.00) and submit an email notification to the appropriate personnel shown in Chapter 1-502.01, Table 1-12 (*Internal Email Distribution List*) and Table 1-13 (*External Distribution List*) for the distribution of Letting Plans revisions.

The email will contain the Revision Letter, the [Estimate Revision Request](#) (.xltx) form and a PDF of the revised sheets only. If the PDF is larger than the allowable email limit, then the PDF should be broken down into smaller files and additional emails sent.

The email subject line shall read:

Region X, County Name, Route Name, PIN nnnnnn-nn, *Roadway* Letting-Revision and Revised Plan Sheets for DD/MM/YYYY Letting

6-403.00 CONSTRUCTION REVISIONS

When a project has been let to contract and a change becomes necessary anywhere on the project, a Construction Plans revision is required. All Construction revisions will be submitted through the Design Manager responsible for the project in an accurate and timely manner.

The Design Manager responsible for the project will upload the revised plan set to Design FileNet according to the process documented in *Chapter 1-105.00* and submit an email notification to the appropriate personnel listed in *Chapter 1-502.00 – Table 1-12, Internal Email Distribution List* and Table 1-13, *External Distribution List*. The email will contain the revision letter and a PDF of the revised sheets only. If the PDF is larger than the allowable email limit, then the PDF should be broken down into smaller files and additional emails sent. The contract number for the project shall be noted in the revision letter, added to the email subject and included in the appropriate data field on FileNet. A Construction Revision may necessitate the requirement for a Right-of-Way Revision as well.

The email subject line shall read:

Region X, County Name, Route Name, PIN nnnnnn-nn, Roadway Construction-Revision